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APPLICATION OF ERTS DATA TO KANSAS AGRICULTURE

Agricultural Statistics from Finney County

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MONTHLY REPORT CONTRACT NAS 5-21822, TEST 60-IV
(ERTS-1 AGRICULTURAL STATISTICS)

A. PROJECT SYNOPSIS

The long-term objective of this project is to develop remote sensors, particularly for use at orbital altitudes, as data sources for agricultural statistics. The immediate objectives are to identify wheat fields in Finney County, Kansas, and to make an assessment of acreage and crop vigor. A variety of methods for yield prediction is already employed by agricultural statisticians in government and industry, and the relationship between yield and weather is well established. Based on ERTS data and available weather records, an assessment of the feasibility of predicting yields will be made. This feasibility will be assessed in terms of accuracy and timeliness vis-a-vis present systems. If successful, the project will provide a model for estimating basic crop statistics and crop yields at regional, national and international scales. Under present strategies these data become available long after they are of practical use.

The objectives of this project are closely related to two other ERTS projects: a probabilistic crop type identification study by R. M. Haralick at the Center for Research, Inc., University of Kansas, and a study of wheat disease and pest recognition by E. T. Kanemasu at Kansas State University. Data and techniques developed in these two projects will materially assist in the solution of the agricultural statistics project.

Preliminary work is now being devoted to three aspects of the project. Mapping and analysis of the distribution of winter wheat in Finney County during the 1971-1972 growing season is underway. The relationships between crop phenology, yield and weather are being examined. Critical parameters of ERTS imagery which will influence interpretation are now being calculated.

B. SUMMARY OF WORK PERFORMED THIS REPORT PERIOD:

Initial coverages of Finney County, Kansas by ERTS-1 have been received. These images have been examined under high magnification on Richards light tables. From this initial examination several points have been determined:

1. rectangular fields of forty or more acres are detectable
2. temporal variance in the return from a given field in a given band is detectable
3. total variance attributable to density of the vegetative cover is detectable
4. fields under flood irrigation at the time of the imaging are apparently identifiable.

A procedure has been designed for efficient location of fields on the data tape. The algorithm for this procedure is presently being implemented. The bulk images will be overlaid with a 1 mm square grid and the target position will be recorded as an X,Y value in terms of displacement from the upper left corner of each image. The digital tapes will then be searched to identify a 100 X 100 data cell matrix centered on the specified X,Y-coordinates from the image. If each data cell represents a 250 X 250 foot ground area, the 100 X 100 computer-generated gray scale map will represent approximately a 4 X 4 mile ground area. The interpreter will then use the computer map to specify the exact data cells associated with each field. These cells will then be used to generate a spectral frequency curve for the field.

Data on weather and crop yield in Finney County have been collected.

C. CONFORMANCE TO WORK SCHEDULE:

We are confident that the objectives of this contract can be met if the satellite continues to operate successfully throughout the next growing season. One of our biggest difficulties is getting bulk imagery as soon as possible after satellite passover. At present we are experiencing a four to six week delay in obtaining bulk imagery.

D. ANALYSIS OF WORK PROGRESS:

Work has progressed satisfactorily considering the rather late launch of ERTS-1. We have had to modify our original work schedule to accomodate the late launch and it is therefore necessary that the wheat planting, harvesting and wheat yield studies be done on the 1972-1973 growing season rather than the 1971-1972 season as originally planned.

E. RELIABILITY OF RESULTS:

Our work is cross referenced with data obtained by Finney County Agricultural Stabilization and Conservation Service personnel as well as with agricultural production data published by the State of Kansas. In addition, we are collecting field and aircraft data to verify our measurement and observations from ERTS-1 imagery. Finally there are two supporting research projects (one treating the analysis of radar imagery, the other, dealing with agricultural information system for Finney County) that will aid in verifying our results.

F. FUNDING:

Salaries and computer time are adequate for the projected work. We may need additional funds for travel and specialized supplies (especially low level aircraft flights) by the end of the contract period. At present funding is adequate.

G. PERSONNEL:

Key personnel on this project include, besides the principal investigator:

1. Mr. Donald L. Williams — photointerpreter, Center for Research, Inc., University of Kansas. B. A., Geography, U. S. Army Intelligence School Interpretation courses, U.S.D.A. graduate school.
2. Miss Bonnie Barker — cartographer, Center for Research, Inc., University of Kansas. B. A. Geography, training in remote sensing photointerpretation and cartography.

H. WORK PLANNED:

Attention will focus on the design of the field sampling strategy and the collection of an adequate body of field data. Work will also proceed on the implementation of a combined man-machine classification algorithm. The field of sampling strategy is unique and critical because of the need for statistical reliability under continuously varying cloud cover.

